FACT SHEET

for the U.S. Environmental Protection Agency's
Renewal of Puna Geothermal Venture's
Underground Injection Control
Class V Individual Permit #HI596002

Location:

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I. Purpose of the Fact Sheet

Pursuant to the Underground Injection Control (UIC) regulations in Title 40, Part 124.8 of the Code of Federal Regulations (CFR), the purpose of this fact sheet is to briefly describe the principle facts and considerations that went into preparing the draft permit. To meet these objectives, this fact sheet contains background information on the permit process, a description of the facility, and a discussion of the permit conditions.

II. Permit Process

Permit History

Under 40 CFR Parts 144.12(c)(1) and 144.25(a)(3), the EPA Director may require the owner or operator of any Class V injection well which is authorized by rule to apply for

and obtain a UIC permit. On June 10, 1996, Puna Geothermal Venture (PGV) was required to file an application for a Class V UIC permit. A Class V Individual UIC permit was issued to PGV on August 25, 2000 for its three existing injection wells (KS-1A, KS-3 and KS-4) and up to seven new injection wells.

In March 2003, well KS-11 was converted from a production to an injection well.

On May 24, 2004, EPA sent a letter to Constellation Energy and Ormat Nevada notifying them that a minor modification was the appropriate method to address a change in ownership and operators at the facility. On August 13, 2004, EPA approved a request for a minor modification of the permit by PGV to reflect this change.

Other Permits Covering the Injection Wells

PGV's injection wells are also regulated by the Hawaii Department of Health (DOH), which required PGV to obtain a State UIC permit, #UH-1529. DOH is in the process of renewing their permit which has been extended and is in full effect. EPA and DOH have worked together to ensure that their two permits are consistent. The DOH has a state UIC program, but is currently not pursuing primary enforcement authority (primacy) for the federally-administered UIC program. Other permits that cover the injection wells include the Hawaii Department of Land and Natural Resources (DLNR) permit to drill up to 30 injection and production wells and the County of Hawaii Planning Department's Geothermal Resource Permit.

Current Application and Review Period

Under 40 CFR Part 144.37 (Continuation of expiring permits) and permit condition III.E.12.a, PGV is required to provide timely application for permit renewal 180 days prior to the expiration of its permit. PGV submitted an application, dated February 25, 2005 with appendices dated February 2005, for the renewal of their EPA UIC permit #HI596002. Therefore, PGV's permit remains in full force and effect even though EPA did not process the permit application by the permit expiration date of August 25, 2005. A letter was sent on August 17, 2005 notifying PGV of this and acknowledging that the administrative and technical reviews of the permit had been completed. Following this, EPA completed a draft Class V individual permit.

Public Participation

Pursuant to 40 CFR 124.10, the public is being given thirty (30) days to review and comment on the draft permit. The draft permit, public notice, this fact sheet and PGV's application are available at:

Pahoa Public Library
15-3070 Pahoa-Kalapana Road
Pahoa, Hawaii 96778
(808) 965-8574

Hilo Public Library
300 Waianuenue Road
Hilo, HI 96720
(808) 933-8888

and at EPA's San Francisco office at 75 Hawthorne Street, San Francisco, CA 94105.

The aforementioned documents, with the exception of PGV's application, are also available on EPA's website at: http://www.epa.gov/region9/water/groundwater/uic-permits.html.

The public is being notified of this thirty-day public comment period by publication of a notice on December 16, 2005 in the following newspapers: the Hawaii Tribune-Herald, West Hawaii Today, and the Honolulu Advertiser. In addition to the public notices in the newspapers, public notices have been mailed to individuals and groups who have expressed an interest in the project.

III. Description of the Facility

PGV is a geothermal power plant that has contracted with HELCO to produce 30 megawatts of electrical power. The project occupies approximately 25 to 30 acres on a 500 acre parcel of land leased by PGV. Geothermal steam from four production wells is used in a noncontact heat exchange process to run turbines to produce electrical energy. Condensed steam (condensate), brine, and noncondensible gases from the production wells, and a small quantity of other fluids (less than one percent of the total flow) consisting of supplemental water, and anticorrosion and antiscaling chemicals are disposed of through four injection wells.

IV. Specific Permit Conditions

Individual Permit

In February 2005, PGV applied for an area permit. However, their current permit is an individual permit for four existing wells and up to six new wells. Following a discussion with the EPA, PGV submitted a letter clarifying that they were applying for an individual permit.

Well Construction

The existing wells, KS-1A, KS-3, KS-4, and KS-11 have multiple strings of cemented casing. On each well, there are two strings of cemented casing that extend the entire length of the Underground Source of Drinking Water (USDW) which is from approximately 600 feet to 2,000 feet below ground surface (bgs). In addition to this, KS-1A and KS-3 each have a string of cemented liner through the USDW. The longest string of cemented casing on each well extends to approximately 3,900 feet bgs. The injection zone is from approximately 3,900 feet to approximately 7,950 bgs, with the principal injection zone being below 5,000 feet.

A generic well construction plan for new wells has been submitted as Attachment L of PGV's application.

Well Location

PGV's application contains the locations of the four existing wells and the well pads where new wells may be drilled.

Well Operation: Injection Pressure Limitations

The draft permit contains injection pressure limits. The intent of limiting pressure and /or volume is to prevent the build up of pressure in the injection zone to a point where it could fracture the formation which acts as a confining zone above the injection zone (40 CFR Part 144.52[a][3]). If fracturing occurred, this could cause the migration of formation fluids and injected fluids into the USDW. The EPA's reasoning for limiting only injection pressure is that as long as the maximum injection pressure does not cause an exceedence of the fracture pressure then there is no threat of fracturing the overlying formation. However, should the maximum injection volume increase to a point where it appears that the maximum injection pressure limitation will be exceeded, then EPA will reconsider setting maximum injection volume limitations.

The proposed maximum injection pressure limitation is 500 pounds per square inch (psig) for KS-1A, KS-3, and KS-4, and 1,040 psig for KS-11. If injection pressures exceed 500 psig at the individual injection pump discharge or 470 psig in the combined brine reinjection line, the injection pumps will shut off automatically. If the combined brine reinjection line pressure reaches 500 psig, the relief valves at the individual wellheads will open to reduce pressure below 500 psig.

For new wells, the maximum injection pressure limitation will be calculated using an appropriate fracture gradient. As described in Attachment H of the application, a pressure Astep test@ will be performed to verify a safe maximum injection pressure limitation.

Corrective Action

The area of review (AOR) consists of an aggregate of one-quarter (1/4) mile radii that extend from the edge of each well pad. Appendix B of the draft permit contains a map with the AOR. The draft permit prohibits the construction of a new injection well or conversion to an injection well unless all improperly completed, improperly sealed, or improperly or temporarily abandoned wells are properly plugged and abandoned, if those wells penetrate the injection zone and are within the AOR of an existing or proposed injection well (40 CFR Parts 144.52[a][9] and [b][1]).

The previous permit required PGV or an entity on behalf of PGV to properly plug and abandon the temporarily abandoned production well HGP-A if a new injection well was drilled within one quarter mile of HGP-A. HGP-A has subsequently been permanently plugged and abandoned.

The draft permit contains a condition that prohibits the drilling of a new injection well or the conversion to an injection well within one-quarter mile of the abandoned scientific observation hole, SOH-1, until internal and external mechanical integrity has been demonstrated to the EPA.

Monitoring Program

The UIC monitoring program at PGV covers the mechanical integrity of the injection wells, injectate quality and quantity, and ground water quality.

The internal mechanical integrity of the injection wells through the USDW is monitored daily by continuous recordings and visual checks of the nitrogen pressure in the annulus of the injection wells. Additionally, external and internal mechanical integrity tests are performed once a year on the injection wells.

Continuous records are made of the injection pressure, injection flow rate, and injectate temperature. Records are also kept on the amount of supplemental (nongeothermal) fluids injected.

The proposed permit contains the following monitoring program: every two months, the facility will be required to conduct basic physical and chemical analyses on the injectate. Twice a year, the facility will be required to conduct more thorough chemical analyses of the injectate and ground water. Ground water samples shall be taken from monitoring wells MW-1 (or MW-3 which is adjacent to MW-1) and MW-2.

Contingency Plan

As elaborated on in Appendix E of the draft permit, (the Casing Monitoring Program), if an injection well loses mechanical integrity during operations, the wells will be examined, repaired, and retested. If repairs to the wellhead do not re-establish mechanical integrity, the well will be shut in. Down-hole diagnostic tests will be conducted and the well will either be repaired and successfully tested before resuming operations, or permanently plugged and abandoned. This procedure also applies to wells that are determined to lack mechanical integrity during annual testing. If all the injection wells are shut in, the permit stipulates that injectate will not be disposed of on the ground.

Plugging and Abandonment

Plugging and abandonment plans have been provided for the existing wells and generic plugging and abandonment schematic have been provided for new wells in Appendix I of the draft permit. Within 60 days of completing a new well, a specific plugging and abandonment plan will be provided for that well. The facility is also required to notify EPA forty five (45) days in advance of plugging and abandoning wells.

Financial Assurance

PGV has provided an irrevocable letter of credit for $800,000 and standby trust agreement. This amount is an estimate of the cost incurred by a third party to plug and abandon the four existing injection wells. The proposed permit requires PGV to annually demonstrate financial responsibility. Prior to the construction of a new injection well or conversion to an injection well, the financial assurance mechanism shall be modified to reflect the cost of plugging and abandoning any additional well.

Duration of the Permit

The proposed permit would be issued for a period of ten (10) years unless duration is modified, or the permit is revoked and reissued, or terminated for reasonable cause (40 CFR Parts 144.39 and 144.40).

Additional Information

For additional information regarding EPA's draft UIC permit or the permitting process, please contact Shannon FitzGerald at (415) 972-3525 or toll-free at (866) EPA-WEST, or fitzgerald.shannon@epa.gov.